

7.3 Residential Toilet Replacement Programs

Applicability

This BMP is intended for a Municipal Water User Group (“utility”) that has at least 20 percent of its homes and apartment units in its service area constructed prior to 1995 and for which there has not been an active retrofit program to replace high flush volume toilets with 1.6 gallons per flush toilets (“ULFT”). A utility that has initiated some of the program elements listed below prior to adopting the BMP can provide documentation of a previous retrofit program or voluntary retrofits by customers as described in Section E. This BMP is often implemented in conjunction with the Showerhead, Aerator, and Toilet Flapper Retrofit and/or the Water Survey for Single-Family and Multi-Family Customers BMPs. Once a utility decides to adopt this BMP, the utility should follow the BMP closely in order to achieve the maximum water efficiency benefit from this BMP.

Description

ULFT replacement programs are an effective method of achieving water efficiency in the residential sector^{1,2,3}. ULFTs are toilets that use 1.6 gpf or less including dual flush toilets that can flush at either 1.6 gpf or 0.8 to 1.0 gpf. State and federal requirements prohibit installation of new toilets using more than 1.6 gpf. Under this BMP, the utility would develop and implement a program to replace existing toilets using 3.5 gpf or more in single-family and multi-family residences. To accomplish this BMP, the utility first identifies single-family and multi-family residences constructed during or prior to 1995.

Implementation

Implementation should consist of at least one of the following:

- 1) A program for replacing existing pre-1995 high water-use toilets with efficient (1.6 gpf or less) toilets in single-family and multi-family residences. The Showerhead, Aerator, and Toilet Flapper Retrofit BMP outlines a method for determining the number of homes and apartments constructed before 1995.
 - a. ULFT models that are used in retrofit programs should maintain 2.0 gpf or less regardless of what replacement flapper is used¹¹
 - b. ULFT replacement programs should offer free toilets or rebates for toilet replacement. Incentives and promotion of the program should be sufficient to retrofit at least 5 percent of eligible homes each year.
- 2) A retrofit ordinance triggered when ownership of the property changes. The ordinance would require all plumbing fixtures in the house or multi-family unit to meet current plumbing standards when the ownership of the property changes. For example, the Lower Colorado River Authority (“LCRA”) requires homes that are being enlarged to be retrofitted with 1.6 gallon per flush toilets as part of its septic regulations⁴. The LCRA requires verification inspections. Several cities in California have implemented ordinances requiring retrofit upon change in

ownership. The buyer and seller certify that the plumbing fixtures meet the efficiency standards⁵. In these cities, no inspection is required.

- 3) A retrofit ordinance by date certain no later than five years after adoption of the BMP. The ordinance would require all plumbing fixtures in the house or multi-family unit to meet current plumbing standards by a specific date.

Schedule

Based on the program(s) selected, use the appropriate schedule:

- 1) Toilet Retrofit Program

In the first twelve (12) months: Plan a program including stakeholder meetings as needed. Locate plumbing contractors or retrofit companies who may be interested in bidding on this program. Develop a plan for educating homeowners, apartment owners and managers, plumbers, and realtors about this program. Solicit bids and initiate the program. Include inspections by utility personnel or third party to verify installation. In order to effectively implement this program, each year 5 percent of eligible single-family homes and 5 percent of eligible multi-family units should be retrofitted.

In the 2nd year and after: Each year 5 percent of identified eligible single-family homes and multi-family units are to be retrofitted. The program should be continued until 50 percent of eligible single-family homes and multi-family units are retrofitted in order to achieve a reasonable water efficiency benefit. Or,

- 2) Ordinance Approach: Upon Change of Ownership of Property

Consider offering rebates for all or a portion of the time this program will be in place. For example, offer rebates for five years and publicize this so customers can take advantage of rebates and retrofit early in the program.

In the first twelve (12) months: Plan a program including stakeholder meetings as needed. Develop a plan for educating realtors and title companies about this requirement. Determine how change of ownership can be obtained from County Appraisal Districts. Plan follow up inspection program or buyer/seller certification program to assure compliance⁵ after retrofit. Develop and pass ordinance. Implement ordinance and tracking plan for number of units retrofitted.

In the 2nd year and after: Continue implementation and outreach program for realtors and title companies. Continue verification inspections or buyer/seller certification program to assure compliance as needed. Or,

- 3) Ordinance Approach: By Date Certain

Consider offering rebates for all or a portion of the time this program will be in place. For example, offer rebates up to Year 4 and publicize this so customers can take advantage of rebates and reduce the enforcement required in Year 5.

In the first twelve (12) months: Plan a program including stakeholder meetings as needed. Determine a plan for educating homeowners, multi-unit owners and managers, plumbers, and realtors about this requirement. Plan follow-up inspections or buyer/seller certification program to assure compliance after retrofits are completed. Develop and pass ordinance. Implement ordinance and tracking plan for number of units retrofitted.

Years 2, 3, and 4: Continue implementation. Continue educating homeowners, multi-unit owners and managers, plumbers, and realtors about this ordinance.

Year 5: If 50 percent of eligible homes and units have not been retrofitted, prepare education campaign about upcoming deadline and fines that may occur if retrofit does not take place by deadline. Prepare compliance program. After deadline, issue penalties for those not complying.

Scope

Annually, the ULFT replacement program should replace at least 5 percent of the estimated number of eligible toilets within the service area.

In order to accomplish this BMP, the utility should perform the following:

- 1) Develop and implement a plan to distribute or directly install high quality ULFTs to eligible single-family and multi-family units;
- 2) Implement the distribution or installation programs so as to achieve ULFT retrofits on at least 5 percent of eligible single-family units and 5 percent of eligible multi-family units each year. Utilities with more than 200,000 eligible connections should retrofit at least 20,000 eligible homes and units each year.
- 3) Within ten years of implementing this program, retrofit at least 50 percent of eligible single-family homes and multi-family units with ULFTs. For utilities with more than 200,000 eligible connections, at least 100,000 eligible homes and units should be retrofitted within ten years. Or,
- 4) Adopt an enforceable ordinance or rules requiring replacement of ULFTs greater than 1.6 gallons per flush, when ownership of the property transfers or by date certain no later than five years from adoption of the BMP, and implement the ordinance or rules with a verifiable inspection program for each property.

Documentation

To track this BMP, the utility should gather the following documentation:

- 1) The eligible number of single-family residences and multi-family units in the service area;
- 2) The average number of toilets per single-family residence; the average number of toilets per multi-family unit;
- 3) The average persons per household for single-family residences; the average persons per household for multi-family units;
- 4) The housing resale rate for single-family residences in service area; the housing resale rate for multi-family units in service area;
- 5) The number of ULFT installations credited to the program participant's replacement program, by year, including brand and model of toilets installed;
- 6) Description of ULFT replacement program, if applicable;
- 7) Estimated cost per ULFT replacement, if applicable;
- 8) Estimated water savings per ULFT replacement; and
- 9) Description of retrofit upon resale inspection and enforcement program, if applicable.

Determination of Water Savings

(See, Section I. References for Additional Information, 2 and 9)

$$\text{Average Daily Savings} = \text{SF} \times (10.5 \times \text{Hs}) / \text{Ts} + \text{MF} \times (10.5 \times \text{Hm}) / \text{Tm}$$

Where SF = Number of SF Toilets Retrofitted

MF = Number of MF Toilets Retrofitted

Hs = Number of people in average single family household

Hm = Number of people in average multi-family household

Ts = Average number of toilets per SF house

Tm = Average number of toilet per MF unit

For Single Family Homes:

10.5 = gallons saved per capita per day if all toilets replaced in each household⁵

Dual Flush ULFTs increase savings by 25 percent.

For Multi-Family Units:

10.5 = gallons saved per capita per day if all toilets replaced in each unit⁸

Dual flush ULFTs increase savings by 25 percent

Cost-effectiveness Considerations

The rebates to the customers for installation of ULFT toilets are the most significant costs of this program. If the rebate cost for the toilet is set too low, only those customers planning to retrofit will do so. If the rebate is set too high, the utility will be overpaying for customers to retrofit. Most utilities have found a rebate to work effectively if set between \$70 and \$100 per toilet.

Some utilities find it is more cost effective to provide toilets free of charge to their customers. Toilets can be purchased from wholesalers by the truckload for \$50 to \$70. There may be additional costs for storage and distribution of the toilets.

Administration of the program can be conducted by utility staff or contracted out. There will be labor costs for application processing and inspections to verify installation, determine if the water level in the tank is properly set, and discourage fraud. Inspection costs will be lower per toilet for multi-family retrofits due to the higher volume of toilets per application, but generally, labor costs range from \$10 to \$40 per toilet. Marketing and outreach costs range from \$5 to \$20 per toilet. Administrative and overhead costs range from 10 to 20 percent of labor costs. If this program is combined with the Showerhead, Aerator, and Flapper Retrofit BMP, there will be efficiencies in these costs.

To calculate the total cost per unit, total all costs and divide by the number of units being retrofitted.

References for Additional Information

- 1) *Handbook of Water Use and Conservation*, Amy Vickers, Waterplow Press, May 2001.
- 2) *Residential End Uses of Water*, AWWA Research Foundation, 1999.
- 3) *Jordan Valley (Utah) Study of ULF Toilet Fixture*, Paula Mohadjer.
http://www.cuwcc.org/Uploads/product/Jordan_Valley_ULFT_study.pdf
- 4) *Lower Colorado River Authority Frequently Asked Questions about its On-Sewage Rules*. http://www.lcra.org/water/faq_septic.html
- 5) *Summary of Residential End Use Study*.
<http://www.aquacraft.com/Publications/resident.htm>
- 6) *Impacts of Demand Reduction on Water Utilities*, AWWA Research Foundation, 1996.
- 7) *BMP Cost Savings and Guide*, California Urban Water Conservation Council, July 2000.
- 8) *Quantifying the Effectiveness of Various Water Conservation Techniques in Texas*, Texas Water Development Board, May 2002.
- 9) *Dual-flush Toilet Project*, Canada Mortgage and Housing Corporation, September 2002. <http://www.cmhc.ca/publications/en/rh-pr/tech/02-124-e.pdf>
- 10) *Dual Flush Toilet Fixtures*, John Koeller and Company, December 2003.
http://www.cuwcc.org/Uploads/product/Dual_Flush_Fixture_Studies.pdf
- 11) *Water Closet Performance Testing*, National Association of Home Builders, September 2002.
http://www.cuwcc.org/Uploads/product/NAHB_ToiletReport.pdf
- 12) *Maximum Performance Testing of Popular Toilet Models*, William Gauley and John Koeller, December 2003.
http://www.cuwcc.org/Uploads/product/MaP_Final_Report.pdf

- 13) *Performance Testing of Wall Mount Siphon Jet Toilets at the University of Washington*, Roger van Gelder, June 2003.
http://www.cuwcc.org/Uploads/product/MaP_Final_Report.pdf
- 14) *Marin Municipal Water District Plumbing Fixture Certificate*.
<http://www.marinwater.org/TOSforms.pdf>
- 15) *Waste Not, Want Not: The Potential for Urban Water Conservation in California*, Pacific Institute, November 2003.